Journal of Global Biosciences
ISSN 2320-1355
Volume 3, Number 6, 2014, pp. 941-950
Website: www.mutagens.co.in
E-mail: submit@mutagens.co.in
researchsubmission@hotmail.com

Research Paper

STUDY ON SOME PHYSICO-CHEMICAL PARAMETER OF LONAR CRATER INDIA

Tandale M. R. and D.S. Dabhade

P.G. and Research Department of Zoology,
R.A. Arts, M .K. Commerce and S .R. Rathi Science College,
Washim, INDIA.

Abstract

Lonar Crater (19^{o}58'N and 76^{o}31'E) Lake is the third largest natural salt-water lake in the world. Lonar Crater is a wet land which is important biodiversity sector. The lake brine supports typical microbial flora and fauna need to be investigated to access its value of wet-land to be recognized as Ramsar Site of India. During the study period Fourteen different Physico-chemical Parameter were studied, temperature, Ph, TDS (Total Dissolved Solid) , Electrical conductivity, DO (Dissolved oxygen) Free CO_2 ,Carbonates (CO_3) and Bicarbonates, Hardness, Chlorides, Salinity, Calcium and Magnesium Hardness. The crater physical setup, its relative Geographical and Ecological isolation evolve Limnological status in a unique way. Its unusual and climatic isolation highlights the ecosystem as an ecological wonder. Present work deals with analysis of Physico chemical parameters that aims to investigate the pollution level to know Eutrophication status of Lonar Crater Lake. The study of hydrological status reveals variation of salinity during rainy season and summer while the lake is leading towards Eutrophication.
Key words: *Lonar Lake, Physico-chemical parameter*.

INTRODUCTION

Lonar crater is believed to be originated due to meteoritic impact and is the third biggest in the world. Lonar crater the only such in the great basaltic province of India. The remarkable shape, size and uniqueness of crater lake at crater basin being saline has attracted the attention of geologist, ecologists, archaeologists, naturalists and astronomists and has been the subject of several studies on various aspects of crater ecosystem. This inland lake with no effluent is fed by a seasonal drainage mainly confined to its periphery and also by number of fresh water springs. The crater contains many sub-ecosystems, each constituting a subtle combination of floral and faunal species, due to localized variations in the conditions of soil, water and humidity. The Lonar ecosystem has evolved in a unique way due to the unusual geohydrological and climatic conditions. However, the same conditions have made it extremely fragile and

vulnerable to human interventions. Therefore, the biotic zones resulting from such isolation need immediate protection. **[7], [6].**

The Lonar crater has attracted the attention of world geologists for investigation of its origin and the source of salinity of lake water; it is ecological wonder **[8].**

The positive correlation has indicated that the abundance of *B. plicatilis* has significantly positive correlation with temperature as there was an increase in all chemical parameters such as water temperature, pH, TS, TDS, Cl, Salinity and EC in the Lonar lake water **[11]**. The time of excavation of material from the crater may last for several minutes following the impact, while the amount of impact melt produced is dependent on the abundance of water in the target rocks **[9].** Target material below the excavation depth is pushed downwards, whereas the strata above this depth may be pushed upwards **[4]** as seen in the Lonar crater. Lonar Crater Lake consist of various eco-tones inhabited a wide range of plant and animals life.

The cultural eutrophication of this lake is takes place due to: The untreated domestic sewage and garbage coming out from Lonar town that reaches into the lake. Inside the crater, some farmers downing farming and hence the use of inorganic fertilizers, insecticides and pesticides like toxic compounds inters in lake. Simultaneously, Hygienic activities are carried out by the local people in the fresh water springs and used waste water enters in lake at last. **[15]**

The lake water was observed to be blue green in color due to dominance of algal bloom in lake water. The water sample emanated strong murky odor. The algal bloom in Lonar Lake water is responsible for absorption of light and heat from sunlight due to its colored pigments leading to higher temperature of lake water. The Lonar Lake water appears to be saline due to high concentration of dissolved solids and total suspended solids **[14].** Lonar Meteorite Lake appear to be a unique aquatic ecosystem characterized by hyper saline, hyper alkaline, poor range in DO but all physico-chemical parameters in this region was beyond the permissible limit in different season only according to WHO and ISI standards. The correlation coefficient indicates significant positive and negative correlation of parameters with each other. The positive correlation means one parameter increase with other parameters also increase **[12].**

Site Description

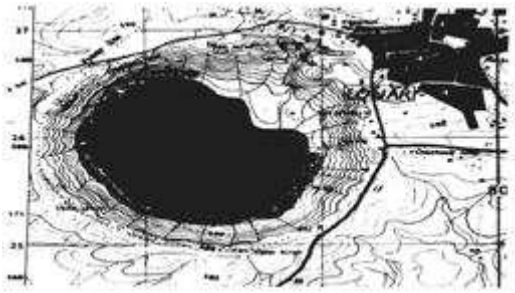


Fig. 1. Topographic Map of Lonar Crater (19^{0}58'N and 76^{o}31'E)

Lonar Crater ***(19^{0}58'N and 76^{o}31'E)*** Lake is a unique meteoritic crater in basaltic rock. It lies in a nearly circular depression surrounding on all sides by steeply rising escarpments. The lake basin is closed on all sides and therefore has no outlet. The lake brine is known for its high salinity and alkalinity, micro-ecosystem, a wide range of plant and animal life. The saline lake, marshy areas around it, freshwater streams, natural and manmade plantations, crop fields and the remnants of the original forest and scrub referred to above, all provide special niches for plants and animals. Lonar Lake has a localized temperature system as it is being subterranean hollow closed from

all sides; the lake basin is partly screened from direct sun light at different places and at different times of the day **[3]**

MATERIAL AND METHOD

Four sampling station selected For the Present work these are S1, S2, S3, and S4 East, south, west and north. Monthly Water sample were collected from four different sampling sites in the periods of One Year (Jul 2013 to Jun 2014). Water Temperature analyzed by simple thermometer, TDS analyzed by the EC-TDS ANALYSER CM 183 ELICO, EC analyzed by Conductivity meter CM-180 ELICO, Total Hardness, Free CO_2, Carbonates, Bicarbonates, Chloride, Salinity, Calcium, Calcium Hardness, and Magnesium Hardness analyzed by Titrometric method with the help of **[1]** standard method for water analysis.

Table No. 1. Physicochemical analyzed Data

Parameters	Site	Month 2013					
		Jan-13	Feb	Mar	Apr	May	Jun
Temp (C^0)	S1	23	25	27	26	27	28
	S2	23	25	27	27	27	28
	S3	24	26	28	28	29	30
	S4	25	26	29	28	31	30
Ph	S1	10	10	10	10	10	10
	S2	10	10	10	10	10	10
	S3	10	10	10	10	10	10
	S4	10	10	10	10	10	10
TDS ppt	S1	4.3	5.9	6.04	6.4	7.6	7.3
	S2	4.2	6.3	5.2	6.3	7.6	7.4
	S3	5.1	6.2	6.6	6.4	7.8	7.4
	S4	5.8	5.9	6.7	6.2	8.3	8.3
EC mS	S1	11.8	11.4	12.4	9.4	12.2	13.2
	S2	11.7	11.2	11.8	10.2	12.3	13.2
	S3	12.2	11.5	11.9	10.2	16.4	14.8
	S4	11.3	10.3	12.5	11.1	14.2	15.3
DO mg/l	S1	4.2	4.8	3.1	1.2	0.6	4.8
	S2	3.3	4.2	2.6	1.2	0.7	5.1
	S3	3.2	4.2	2.4	1.4	0.5	4.6
	S4	2.8	4.6	2	0.9	0.3	4.4
CO_2 mg/l	S1	ABS	ABS	ABS	ABS	ABS	ABS
	S2	ABS	ABS	ABS	ABS	ABS	ABS
	S3	ABS	ABS	ABS	ABS	ABS	ABS
	S4	ABS	ABS	ABS	ABS	ABS	ABS
CO_3 mg/l	S1	440	520	728	964	1142	1740
	S2	400	484	704	928	1364	1686
	S3	400	548	762	884	1242	1644
	S4	360	564	806	970	1294	1576
HCO_3 mg/l	S1	880	1064	1404	1280	2184	946
	S2	1124	1026	1128	1244	1854	732
	S3	1206	1374	1366	1372	2072	724
	S4	1252	1406	1664	1156	2284	762

Total Hardness	S1	84	64	94	128	116	88
	S2	52	68	96	116	144	76
	S3	52	66	96	124	146	72
	S4	64	56	106	126	162	76
Chloride mg/l	S1	4161.83	5537.29	3920.7	3282.6	4835.3	3686.8
	S2	3566.27	4069.66	4140.5	3715.1	3885.3	4055.48
	S3	3984.58	4176.01	4268.1	3991.6	4062.5	4565.96
	S4	4828.29	4353.26	4565.9	4027.1	5168.6	4523.42
Salinity mg/l	S1	7512.13	10160.9	7194.6	6023.7	8872.9	6765.3
	S2	6437.14	7467.8	7597.9	6817.3	7129.5	7441.8
	S3	7192.19	7662.9	7832.1	7324.7	7454.8	8378.5
	S4	8715.09	7988.2	8378.5	7389.7	9484.3	8800
Calcium mg/l	S1	21.88	53	21.88	26.9	30.3	26.9
	S2	26.93	70.7	27.7	23.56	32	23.5
	S3	36.19	36.2	26.9	28.6	32	21.8
	S4	30.3	45.45	31.9	28.6	35.3	20.2
Calcium Hardness mg/l	S1	5.46	13.23	5.46	6.72	7.56	6.72
	S2	6.72	17.64	6.93	5.88	7.98	5.88
	S3	9.03	9.03	6.72	7.14	7.98	5.46
	S4	7.56	11.34	7.98	7.14	8.82	5.04
Mg. Hardness mg/l	S1	19.16	12.38	21.6	29.6	26.4	19.83
	S2	11.048	12.28	21.7	26.8	33.1	17.10
	S3	10.48	14	21.7	28.5	33.6	16.23
	S4	13.77	11	23.9	29	37.3	17.31

RESULTS AND DISCUSSION

The most important physical parameter Temperature of Four sampling sites (**Table No.1)** was measured during the study period minimum temperature ranges from 23C^0 and maximum to 31 C^0. At sampling site S1 minimum temperature 23 C^0 and maximum was 28C^0 During Temperature was gradually increases during this season. In sampling site S2 Minimum 23C^0 and Maximum 28C^0. At Sampling Site S3 minimum temperature was recorded 24C^0 and Maximum was 30C^0. At sampling site S4 minimum temperature was 25C^0 and maximum 31C^0. Slight fluctuation was their due to changing time of sampling. **(Graph plate no.1)**

During the study period Ph of four sampling site was recorded 10 which is alkaline. The pH values of the lake water are generally higher than 10 and occasionally reaching 12 **[13].** TDS (Total Dissolved Solid) during the study period Minimum TDS was found to 4.2 ppt. and Maximum was 8.3 ppt. At sampling site S1 minimum was 4.3ppt. And maximum was 7.6 ppt. At sampling site S2 minimum was 4.2 ppt. and maximum was 7.6 ppt. At Sampling Site S3 minimum TDS was recorded 5.1 ppt. and Maximum was 7.8 ppt. At sampling site S4 minimum TDS was 5.8 ppt. and maximum 8.3 ppt. during the month of Jan to Jun it was increases. (**Graph plate no. 6).**TDS in Lonar water sample was in the range of 6.4 mg/L to 15.2 mg/L studied by **[10].**

Electrical conductivity during study period minimum Electrical conductivity was found to be 9.4 mS and Maximum was 16.4 mS, highest values recorded in the month of May. (**Graph plate no. 7).** DO (Dissolved oxygen) during study period minimum was 0.3 mg/L and maximum was 5.1 mg/L little fluctuation is observed due to time of sampling. In sampling site S1 minimum DO was 0.6 mg/L and maximum was 4.8 mg/L. At

sampling site S2 minimum was 0.7 mg/L and maximum was 5.1 mg/L. At S3 minimum was 0.5 mg/L and maximum was 4.6 mg/L. in sampling site S4 minimum DO was 0.3 mg/L and maximum was 4.6 mg/L. (**Graph plate no. 2).**

Free CO_2 was absent in four sampling site during the study period. $C0_3$ (Carbonates) Due to absent of free CO_2 that may be converted in to carbonates or Bicarbonates along the four sampling site minimum carbonates was 360 mg/L and maximum was 1740 mg/L. In sampling site S1 the minimum $C0_3$ was 440 mg/L and maximum was 1740 mg/ L. At site S2 minimum was 400 mg/L and Maximum was 1686 mg/L. at sampling site S3 minimum was 400 mg/L and maximum was 1644 mg/L. At site S4 minimum was 360 mg/L and Maximum was 1576 mg/L. During the month of Jan to Jun Carbonates was increases. Highest value observed in month of Jun and lowest was observed in Jan.(**Graph plate no. 4).**

HCO_3 (Bicarbonates) during the study periods minimum value of Bicarbonates was 724 mg/L and maximum was 2284 mg/L. In sampling site S1 minimum was 880 mg/L and maximum was 2184 mg/L. at sapling site S2 minimum was 732 mg/L and maximum was 1854 mg/L. Bicarbonates value was increases from month of March to May and little fluctuation in month of February and then it can again increases from month of March. At sampling site S3 the minimum value was 724 mg/L in month of Jun and maximum was 2072 mg/L. In sampling site S4 minimum value of Bicarbonates was 762 mg/L and maximum was 2284 mg/L. In all four sampling site values are fluctuated due to the time of sampling. (**Graph plate no. 5).**

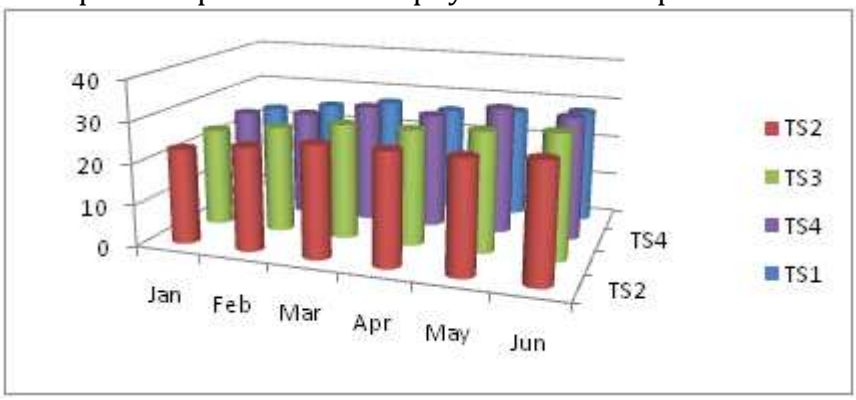
Total Hardness in four sampling site in the study periods was 52 mg/L to 162 mg/L. At sampling site S1 minimum value of Hardness was 64 mg/L and maximum was 128 mg/L. At S2 it was 52 mg/L and maximum was 144 mg/L. At S3 minimum was 52 mg/L and maximum was 146 mg/L. at S4 minimum was 56 mg/L and maximum was 162 mg/L. (**Graph plate no. 3).** During the study period minimum chloride was 3282.6 mg/L and maximum was 5537.29 mg/L. At sampling site S1 minimum was 3282.6 mg/L and maximum was 5537.29 mg/L. In sampling site S2 minimum was 3566.27 mg/L and maximum was 4140.5 mg/L. At S3 minimum was 3984.58 mg/L and maximum was 4565.96 mg/L. in sapling site S4 minimum was 4027.1 mg/L and maximum was 5168.6 mg/L. (**Graph plate no. 8).**Permissible value of chloride is 250 mg/l, **[5]** Also found about 3248.9 mg/l, which is above the maximum permissible level of 1000mg/l. High chloride waters may also produce a laxative effect.

Lonar crater is well known about their alkalinity and salinity. During this study periods the minimum value of salinity was 6023.7 mg/L and maximum was 10160.9 mg/L. At sampling site S1 minimum salinity was 6023.7 mg/L and maximum was 10160.9 mg/L. At sampling site S2 minimum was 6437.14 mg/L and maximum was 7597.9 mg/L. At S3 minimum was 7192.19 mg/L and maximum was 8378.5 mg/L. In sampling site S4 minimum value was 7389.7 mg/L and maximum was 9484.3 mg/L. (**Graph plate no. 9). [2]** was recorded salinity from 8460 mg/L to 10250 mg/L. Calcium during study periods lowest value of Calcium was 20.2 mg/L and highest was 70.7 mg/L. In sapling site S1 minimum value of calcium was 21.88 mg/L. and maximum was 53 mg/L. At sampling site S2 minimum value of calcium was found to be 23.5 mg/L and maximum was 70.7 mg/L. At S3 minimum was 21.8 mg/L and maximum was 36.2 mg/L. At sampling site S4 minimum was 20.2 mg/L and maximum was 45.45 mg/L. Highest calcium value is recorded in month of February and Lowest was in month of Jun. (**Graph plate no. 10).** Calcium Hardness During the study periods minimum value of calcium Hardness was 5.04 mg/L and maximum was 17.64 mg/L. At sampling site S1 minimum value of calcium hardness was 5.46 mg/L and maximum value was 13.23

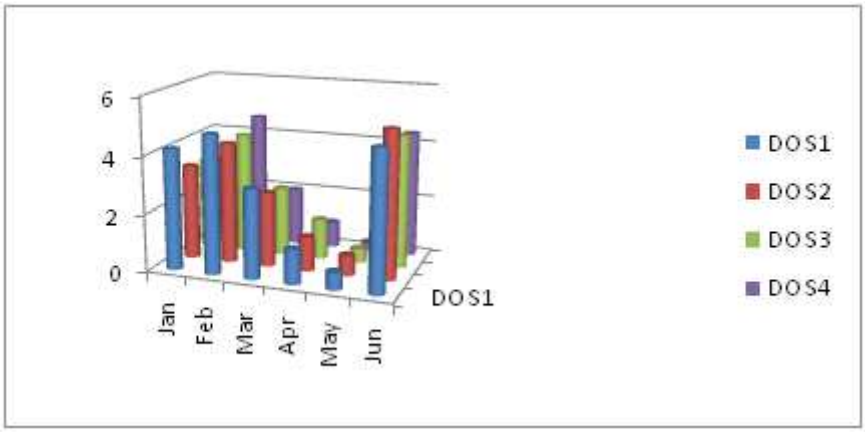
mg/L. At sampling site S2 minimum was 5.88 mg/L and maximum was 17.64 mg/L. At S3 minimum was 5.46 mg/L and maximum was 9.03 mg/L. At sampling site S4 minimum value of calcium hardness was 5.04 mg/L and maximum was 11.34 mg/L. Highest value recorded in month of February. (**Graph plate no. 11).**

Magnesium Hardness During the study periods minimum value of magnesium was 10.48 mg/L and maximum was 37.3 mg/L. at sampling site S1 minimum value of Mg. hardness was 12.38 mg/L. and maximum was 29.6 mg/L. At sampling site S2 minimum was 11.048 mg/L and maximum was 33.1 mg/L. At sampling site S3 minimum value was 10.48 mg/L and maximum value was 33.6 mg/L. at sampling site S4 minimum value was 11 mg/L and maximum was 37.3 mg/L. (**Graph plate no. 12).**

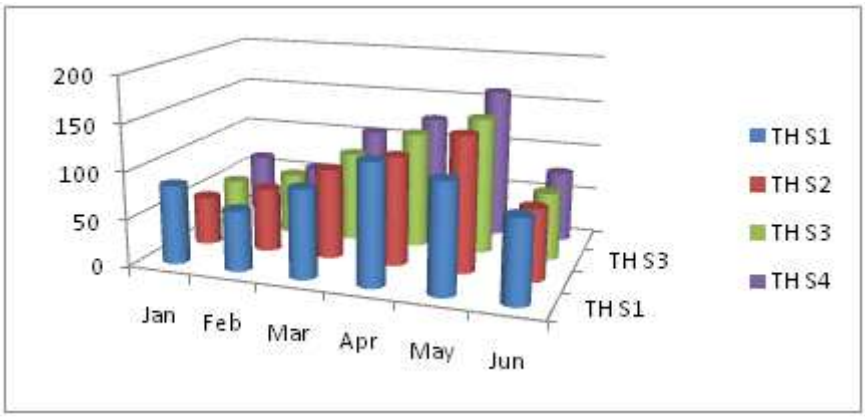
Graphical representation of physico-chemical parameters.



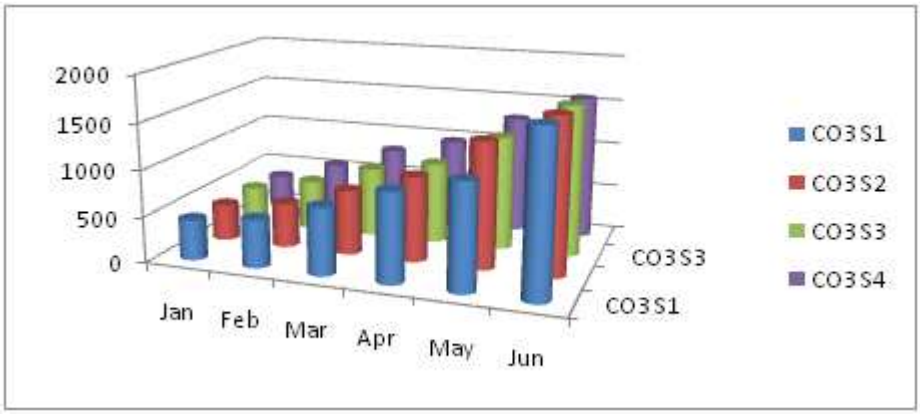
(Graph plate no.1) Physical Parameters - Temperature (C^0) at sampling site (S1, S2, S3, S4), 2013.



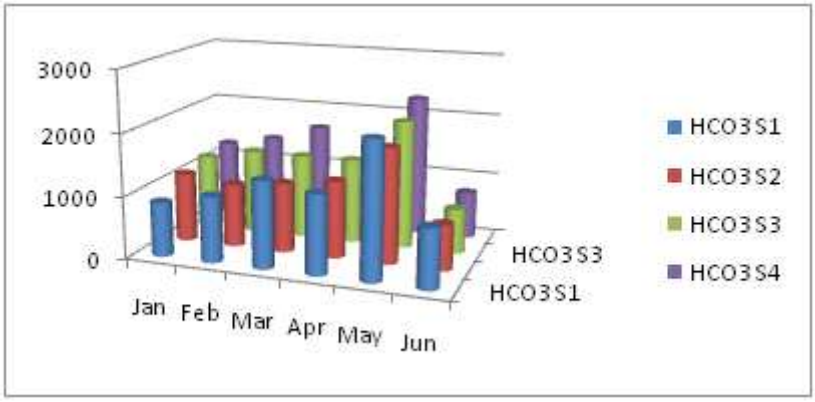
(Graph plate no.2)Physicochemical Parameters- DO (mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



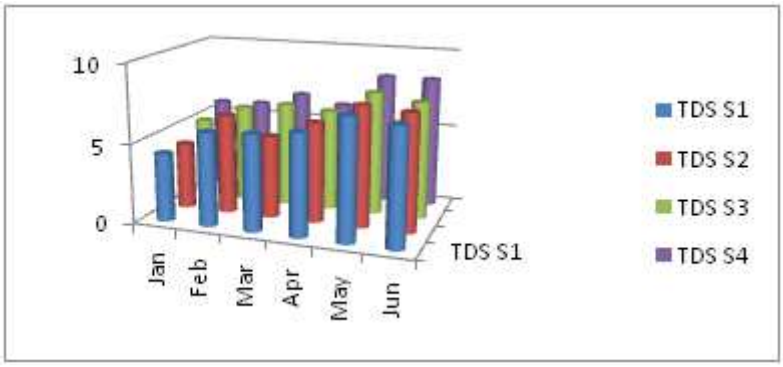
(Graph plate no.3)Physicochemical Parameters- Total Hardness (Mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



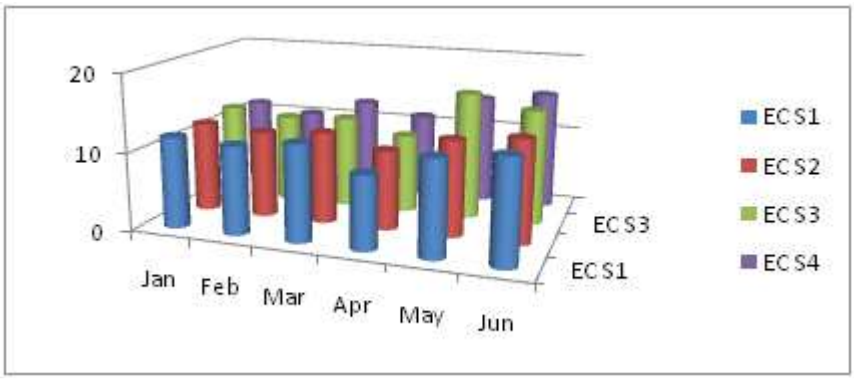
(Graph plate no.4)Physicochemical Parameters- Carbonates (mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



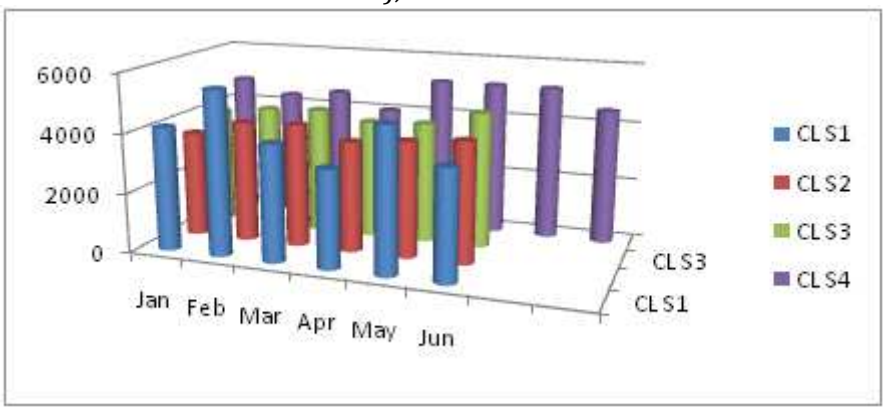
(Graph plate no.5)Physicochemical Parameters Bicarbonates (mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



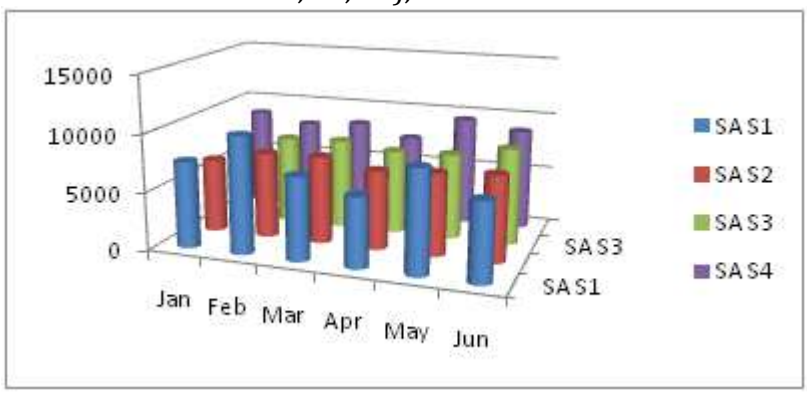
(Graph plate no.6)Physicochemical Parameters- TDS (mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



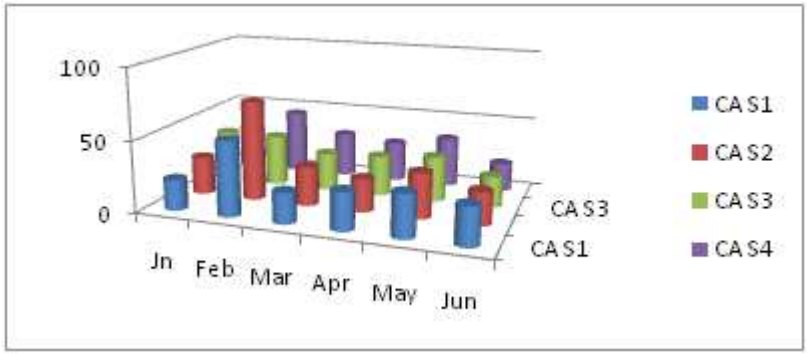
(Graph plate no.7)Physicochemical Parameters- EC (mS) at sampling site (S1, S2, S3, S4), 2013-14.



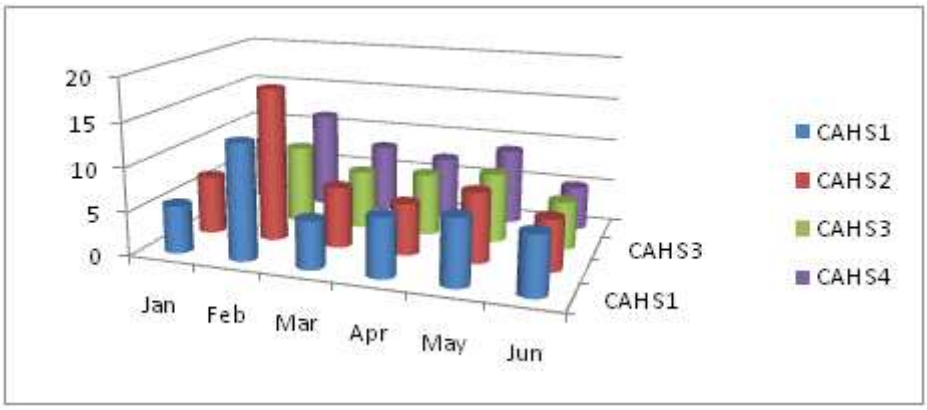
(Graph plate no.8)Physicochemical Parameters- Chloride (mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



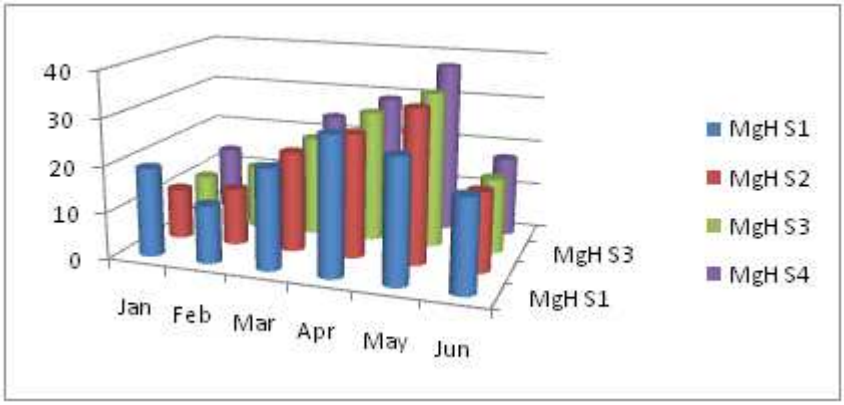
(Graph plate no.9)Physicochemical Parameters- Salinity (g/L) at sampling site (S1, S2, S3, S4), 2013-14.



(Graph plate no.10)Physicochemical Parameters- Calsium (mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



(Graph plate no.11)Physicochemical Parameters-CalciumHardness (mg/L) at sampling site (S1, S2, S3, S4), 2013-14.



(Graph plate no.12)Physicochemical Parameters Mg. Hardness (mg/L) at sampling site (S1, S2, S3, S4),2013-14.

CONCLUSION

Lonar Crater Lake is a wet land of important biodiversity. It is extremely important for waterfowls, ducks, cranes, and many other migratory birds and microscopic organisms. The hydrological study reveals deteriorating changes leading towards Eutrophication led to reduction of flora fauna and macrophytes and increase in pathogenic organisms. It is necessary to compile the available data together, so that the remedy for the conservation of the Crater will be possible only through comprehensive conservative measures which will be conceived during the project work. The lake brine: supports typical microbial flora and fauna need to be investigated to access its value of wet-land to be recognized as Ramsar Site of India.

AKNOWLEDGEMENTS

We are thankful to Principal Dr. S. L Sarambekar, R.A. Arts, M .K. Commerce and S .R. Rathi Science College, Washim. (MS)., for encouraging research and providing laboratory facilities to them. This research paper is a outcome of Major Research Project sanctioned to College therefore we are grateful to UGC for providing generous financial assistance for Major Research Project.

REFERENCES

[1]APHA, (2006): Guidelines for drinking-water quality [electronic resource] incorporating first addendum.Vol. 1, Recommendations. – 3rd ed.

[2]Borul, SB (2012): Study of water quality of Lonar Lake, Journal of chemical and pharmaceutical research, vol. 4(3): 1716-1718.

[3]Dabhade, DS (2006): Limnological studies on Lonar Crater Lake, Maharashtra. Ph.D. Thesis submitted to S.G.B. Amravati University, Amravati.
[4]dePater, I and Lissauer, J.J. (2001): Planetary Sciences, Cambridge Univ. Press, pp.528.
[5]Gaikwad, RW and Sasane, VV (2013): Assessment of ground water quality in and around Lonar Lake and possible water treatment. International journal of environmental sciences, vol. 3,No 4.
[6] Kodarkar, MS (2008): Conservation and Management of Lakes Case Studies from India. Proceedings of Taal 2007, The 12th World Lake Conference: 1442-1445.
[7]Malu, RA (2002): Lonar crater saline lake, an ecological wonder in India. (http://www.isslr.org/news/newsone.asp?qnewsid=188)
[8]Malu, RA, Dabhade, DS and Kodarkar, MS (2007): Conservation and management of Lonar Lake, An Ecological Wonder, Maharashtra, India. World Lake Vision-Action report, International Lake Environment Committee Foundation (ILEC), Japan, pp 208-216.
[9]Melosh, HJ (1989): Impact Cratering: A Geologic Process, Oxford University Press, Oxford, 245 p.
[10]Pawar, A L (2010): Seasonal Variation in Physicochemical quality of Lonar Lake Water.
[11]Pedge, SS , Ahirrao, SD and Garad, VB (2013): Seasonal variations with physico-chemical correlation of *B. plicatilis* in Lonar Meteorite Crater, India. Int. Journal of Life Sciences,Vol.1 (4): 317-320.
[12]Pedge, SS and Ahirrao, SD (2013): Assessment of Environmental Impact on Lonar Lake Water, (MS) India, Middle-East Journal of Scientific Research 15 (9): 1285-1289.
[13]Shinde, VA and More, SM (2013): Study of Physicochemical Characterization of Lonar Lake Effecting Biodiversity Lonar Lake, Maharashtra, India. International Research Journal of Environment Sciences Vol. 2(12), 25-28.
[14]Verma, S R and Chaudhari, PR (2013): Limnological Studies on Indian Brackish Water Lonar Lake with Special Reference to Trophic Status and Potential Public Utility, Research Journal of Chemistry and Environment, Vol.17 (4)
[15]Yannawar, VB and Bhosle AB.(2013): Cultural Eutrophication of Lonar Lake, Maharashtra, India, International Journal of Innovation and Applied Studies Vol. 3 No. 2: 504-510